JPRS-ESA-84-029

3 August 1984

East Europe Report

SCIENCE & TECHNOLOGY

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ACHIEVEMENTS IN LASER DEVELOPMENT

Sofia POGLED in Bulgarian 18 Jun 84 pp 1, 5

[Interview with Scientific Associate Vladimir Ribarov by Stefka Popova: "What the Most Powerful Bulgarian Laser Can Do"]

[Text] Scientific Associate Vladimir Ribarov from Plovdiv: We should set a great goal at least once in a lifetime, and we should devote ourselves entirely to attaining it.

[Stefka Popova] The idea of meeting with the chief of scientific developments at the Scientific Production Enterprise for Optics and Laser Technology in Plovdiv, Scientific Associate Vladimir Ribarov, kindled my imagination. What haven't I heard or read about the omnipotent, handsome laser?

Ribarov is of average height, with a delicate build and fine feature. His face looks tired, even more exhausted than his 40 years of age.

The enterprise, which was estabished in January 1981, is undergoing all the difficulties which innovations must face before they come into our lives -- shortages of specialists, buildings, tools, and machines . . . All this has been overcome by the first 15-20 young design engineers whose work experience ranges from 2 to 4 years.

[Ribarov] As the chief of developments, I had to walk a tightrope between excessive optimism and excessive pessimism. They had all completed higher education, though at the beginning they used to ask, whether in earnest or not: What is a laser? Some of my colleagues -- both specialists and professionals -- used to tell me that this wouldn't work, having in mind the result expected and the short time given to complete it. I had worked for about 14 years at the Institute for Non-Ferrous Metals in Plovdiv. I had good training in the Soviet Union; I graduated in Physics at Leningrad University, and then I was a graduate student of Prof S. E. Frisch, and I was preparing to defend my dissertation by correspondence. I had to drop out, but I think I was successful. This is a paradox. I am convinced that if the task had been assigned to a unit which had already been working in this area, it would have been very difficult to find 10 people to take up this challenge, believing that they would be able to finish the work in the time allotted. I came out on top because I started with precisely these young lads who were not aware of the difficulties. When they went deeper into the problems, when they saw the design and understood that "the devil wasn't dreadful," they became more

optimistic than I was. This optimism was maintained throughout the whole time. I was the only one who had any fears . . .

[Question] At the beginning they started negotiating with the financing organization for making a laser, within 4 years, with a capacity of 300 watts. In the course of the negotiations, however, the laster was now supposed to be more powerful -- 1000 watts and the time for completing it shrank to 2 years; also added were the technological installation and laser technologies.

[Answer] It was unrealistic to set ourselves a goal of creating a new invention of a solely Bulgarian laser, as the first task and within this tight schedule. We decided that it would be more appropriate to begin on the basis of foreign developments. This is how we made the Khebur-I. After all, a laser technological complex, provisionally called LTC-I, resulted from three developments -- laser, installation, and technologies. The LTC-I is programmed for operation and the entire complex is a synthesis between laser technology, robotics and electronics.

[Question] You mentioned that these are the most powerful Bulgarian lasers.

[Answer] Yes, these are the most powerful Bulgarian lasers for the time being. Let me be more specific and point out that they are not exactly Bulgarian patented lasers. It is important for our country, though, that the second version, the Khebur-E, be made entirely with Bulgarian materials and materials imported from socialist countries, with parts and devices which are already in serial production. It is not exactly true that we simply copy foreign models, because a number of systems and design solutions are our own. Laser optics was one of the basic problems. Only Western firms offer optics on the market for such powerful lasers, and at very exorbitant prices, too. These elements, though wear out very quickly. Thus we would always have to depend on their embargo. It was very important for us to be able to maintain our own lasers without any currency costs for the users. Otherwise, this equipment would have found that its path to the plants was closed. One of our groups succeeded, in only a year and a half, in developing the technology, and we can now produce all the optical elements which are included in the complex, and for most of them we are using local raw materials. We carried out the installation together with Beroe in Stara Zagora. We took the best from the scientific and technical point of view -- a digital program contral system largely implemented in our country under a Japanese license. As a control system, it goes with a whole range of metal cutting machines. In addition, the separate junctions and system are not new to production and because of this it was possible to make this machine quickly. As far as the technologies are concerned, we also chose the most effective middle path by concentrating our attention on materials which are most often used in our enterprises.

[Question] What would you say if you happened to read that the most powerful Bulgarian laser is not yours but someone else's?

[Answer] I have read such pronouncements, but this is only juggling terminology, because the question is one of an impulse laser which reaches its peak capacity

at the limit of the impulse. Its average capacity, which covers its technological operations, is 50 watts. Our mode of operation is continuous, the 1000 watt beam is emitted constantly.

[Question] And what can this big child of yours, the LTC-1, do?

[Answer] Quite a few things. For example, it can precut alloyed and unalloyed steel according to a given program into planar surfaces with complex outlines and details at a thickness of 8-9 mm, and the size of the working area (and consequently of the details) from 130-140 cm to 2 meters. If we take the advantages of laser cutting as a whole, this makes our technology competitive. None of the other technologies, perhaps the plasmic one in some versions, can give such precision. What is the effect then? At a number of enterprises, the cutting is done quickly, cheaply, and roughly. After that 2-3 workers pick up the sanders and begin smoothing the outlines. With the laser, this operation will be omitted. Second, laser welding cannot be compared to conventional methods in a number of indices. Vacuum density, high pressure endurance, welding heterogeneous metals or alloys -- alloyed steel with ferrous steel, tool steel with ordinary steel, and so forth -- all these are accessible to electronic beam welding alone. The latter requires, however, that the details be put into a vacuum chamber, so the welding of larger sizes can become a problem. The laser does this without a vacuum. Third, the laser is used for thermal processing. We have the information that technologies for surface thermal processing with a laser have been adopted at a number of large automobile companies, such as General Motors in the United States, or adopted in an experimental way at the Likhachov plants in the USSR. According to data from the Soviet Union, hardening the cyclinder sleeves increases the automobile's effective utility up to 300,000 km, the main reason for engine repair becomes unnecessary. At the request of the Bulgarian engine building industry, we are working on the problem of thermal processing of the main materials of the cylinder block in diesel engines. The idea is to take away the cylinder sleeves and through thermal processing, to form the cylinder from the main material. In addition to such revolutionary simplification of technology, it is expected that, as automakers would have us believe, there will be a 20-30 percent increase in engine power, with its size remaining constant. On the basis of our developments, we have succeeded in almost a year in adopting the process of laser thermal processing, and we already have the parameters of the material after this operation. If all of this reaches the industry, as we hope, the economic and scientific-technical results will be comparable with the greatest in world achievements.

[Question] What is your most important achievement from all this enormous labor?

[Answer] The fact that we already have several dozens of well-trained specialists in designing this equipment who are quite capable of undertaking their own projects. This will give a boost for prospective developments which are already at a world level. Our new developments on powerful multikilowatt lasers are already in process, and we anticipate using our own designs, in some versions, for the whole complex.

[Question] Are there such lasers in other socialist countries as well?

[Answer] There are experimental developments of even more powerful lasers in various countries. For instance, our journals tell us about lasers of 5, 10 and more kilowatts in the Soviet Union. But none of the other socialist countries offers a laser with a capacity of 1 kilowatt and up as a marketable product, not to speak of the whole technological complex. If we were to bring our laser complex on the market as a complete serial production, we would be the first among socialist countries.

[Question] An how would this take place?

[Answer] We anticipate that it could be done by the end of this year. The complex approach to solving scientific-technical problems has allowed us to create, in only 2 years, a device that can be installed at a plant and begin operating immediately.

[Question] How many hours per day do you work here?

[Answer] We are not here to be praised. It is good to do your work in a planned, organized way, without storming and without heart attacks. However, we did not have a choice. Success was our only warranty for working in a desired area. Many believed that Plovdiv was not the place for such work. So it was a quesiton of prestige as well.

[Question] Is it possible to evaluate one's own capabilities?

[Answer] An intelligent young man needs 2-3 years after completing his education and beginning to work to realize clearly where his place as a specialist is, in terms of level. And, if he is a specialist, is he a genius and will he do something that will win him a Nobel Prize, or is he a person who carries out obligatory assignments and nothing other than his salary interests him, or, as most often happens, is he somewhere in the middle? But where exactly -- a little below the average or a little above the average level?

[Question] How do you classify yourself?

[Answer] Well . . . Let's say a little above the average. I'll be frank. When I go to the Soviet Union, I feel inferior because people there know a lot. I do not feel inferior in our country, and I feel quite well in our okrug. The colleagues I work with, in my opinion, are somewhere in the middle in terms of engineer cadres. Well, it turns out that one can achieve a lot with such potential, provided that everyone makes a resolution that he will give all that he is capable of each day. Should not a person set a great goal at least once in a lifetime and give a maximum of effort to achieve it? Of course it requires a lot of work, an awful lot of work! An average of 10 hours per day, with weekends, and without vacations. My annual vacations have lasted only 3-4 days. If you allow yourself to be sick you lose control. Another obligatory condition in setting the course of developments is to balance the minimum and the maximum, to find the best approach and maintain the optimum level.

[Question] What is work for you? Obligation, ambition, passion, hobby?

[Answer] Passion. The first gas laser was made in 1961. In 1963-64, I was already using red and infrared helium-neon lasers in laboratories at Leningrad University. A laser is something very beautiful, very effective. I decided even then that I would be making lasers. Here, though, I had to work on something else. I have always made an effort, however, to direct my work at the institute so that I am able to maintain and improve my training. This is why, when I was given the chance to work in this area, I already had quite a bit of knowledge.

[Question] What is the most difficult thing for you now?

[Answer] I will tell you. Only about 30 percent of my own efforts as a specialist and chief of developments (and of some more of the people around me) go into solving scientific-technical problems. The other 70 percent is used for "breaking barriers."

[Question] Are today's young people very different from your generation?

[Answer] Quite different. I say this at the risk of falling into the elderly category. It is not a matter of age, however, but perhaps rather of altered circumstances of education. I am afraid of talking about all young people, so I would rather speak about a few of the people around me. It bothers me that, first of all, they calculate what they personally are going to receive if they do something, and only then do they set to work. When I was changing my job, I also though about what I would lose and what I would gain, but I am not speaking about myself, rather my generation. We could say: "Well, I guess it's obvious that I'm going to be a loser, but I'll do it anyway to satisfy an inner need of mine." And I am not going to be angry because I have my own philosophy: I have set myself a certain goal, I have something, I have not succeeded in doing something else, but all in all, I have no reason for having a guilty conscience or being unsatisfied with my life.

[Quesiton] Does this make you happy?

[Answer] How could I know if this could be called happiness? It's better if it's better (he laughs). As for happiness . . . If only I didn't get so tired . . . If an inner equilibrium could be considered a part of happiness, then thank God I have it. Well, it does impress me, though I have not experienced it, if a waiter tosses a pile of money on the table and says, "It's my treat," and if the other one calls out, "When I went to Italy last year . . ." As far as I am concerned, I cannot pull out a pile of money, neither can I boast about a trip abroad. This often creates an inferiority complex in young people, and even in people my age. It distorts their interests. And here I am, calmly drinking my vodka because I know that they have one thing and I have another. I cannot bring an end to something that satisfies me professionally and that is beneficial to the state. I believe this is the same with other people I work with.

12334
CSO: 2202/15

DEVELOPMENT OF PERSONAL COMPUTERS EXAMINED

Sofia TEKHNICHESKO DELO in Bulgarian 16 Jun 84 p 5

[Article by engineer Aleksandur Yavrichev: "Appointing Aids to the Microcomputer"]

[Text] Personal computers became popular only at the end of the last decade, and over 2.5 million have already been sold worldwide so far. It is expected that by the mid-1980's the sales of personal computers will surpass 4 million. This interest is totally justified: microcomputers, despite their small size, are competing with traditional, average-sized computers; they do not require special operating conditions and can be installed in an office, a laboratory, or a workshop. It is also very important that a specialist can operate them without an intermediary (an operator of classical computing machines). The production of microcomputers, however, is only one side of the question, because as with its big brothers, in order to develop their capacities fully, they should have different auxiliary devices available for input and output of graphic data, for printing texts, data storage, and so forth. Therefore, developing and preparing the necessary peripheral devices is not, at any rate, a peripheral question.

A "new wind" in computer technology was duly felt in our country. The IMKO-1 personal computer was created at the Institute for Technical Cybernetics and Robotics in Sofia, and it was soon followed by the IMKO-2, which is already in regular production, under the Pravets trademark, at the Instrument Building Plant in Pravets. Other enterprises around the country will begin production this year of some auxiliary microcomputer devices.

Leaving behind one kind of production and taking on another has its own logic. All that is needed is to have the microcomputer available; finding spare parts is easy if auxiliary devices are provided either by importing them or obtaining other substitutes. For instance, a black-and-white or color television set can be successfully used as a video monitor for the personal computer. The Sofia 31 portable television set was used with the first models of the IKMO-2 for this purpose. However, the television set has many features that are not necessary in this instance (it is easy to explain the reasons why), that is, such a monitor ends up being very expensive. Of course, it is possible to remodel the television set in order to satisfy one's needs effectively. The best way, however, would be to arrange special production of video monitors. This has already been done; a trial series of black and green

video monitors designed to work with the Pravets microcomputers was carried out at the Analitik plant in Mikhaylovgrad. The screen is 31 cm measured diagonally, and allows typing of 24 lines with 40 characters each. The adoption of color video monitors is about to begin, and regular production of them is scheduled for the second half of the year. They have almost the same diagonal measurement -- 32 cm.

By the end of this year, another plant, the Kocho Tsvetarov Instrument Building Plant, will begin production of a miniplotter for the Pravets microcomputer. This peripheral device permits the printing of graphs, drawings, curves of mathematical funcitons, and other graphic information created by the computer, onto paper. The miniplotter can also reproduce test. It operates with markers in six colors, which makes it possible to see clearly even the most intricate tangle of lines. In addition to that, the accuracy is very good -- the allowable error is 0.1 mm. The device's operating speed will certainly be of interest to specialists -- 50 mm/sec. The size of the drawing board is another important parameter -- 300/420 mm.

Similar to large computers, a microcomputer needs external memory. If a diskette magnetic carrier is used for this purpose, the computer should be supplied with a minifloppy disk device. The serial production of the necessary minifloppy disk devices is scheduled for the end of this year. The manufacturer is the same -- the Kocho Tsvatarov Instrument Building Plant in Poovdiv. The new ministorage device will operate with diskettes that have 140 kilobytes of information capacity. The speed of data exchange achieved is 250 kilobytes per second.

12334
CSO: 2202/15

PROGRAM PACKAGE, MAS-M ACQUIRED FROM HOSKINS DESCRIBED

Budapest SZAMITASTECHNIKA in Hungarian No 10, 1983 p 3

/Article by Miklos Mezo, SZAMALK /Computer Technology Applications Enterprise/: "Description of the MAS-M Program Package"/

/Text/ The MAS-M /Modular Applications System for Minicomputers/ is the newest program package of Hoskyns Group Ltd designed for the PDP 11/34, 44 and 70 model computers of DEC /Digital Equipment Corporation/ using the RSTS/E operating system and the BASIC-PLUS-TWO language, which has been adapted for the VAX machines also. Of the machines obtainable in Hungary the program package can be run on the TPA 11/40, 48 and 440 and the SM-4 machines.

Naturally the hardware needs of the program package are a function of the task you want to solve; in general, however, it can be said that it was designed for larger configurations. The minimal requirement is 256 K bytes of storage and 40 M bytes of disk space. This requirement is met by the TPA and SM-4 machines, for example, by using the 29 M byte Bulgarian disk units. The MAS-M program package can be run from VT52 and VT100 terminals; Videoton and Orion sell a terminal which is VT52 compatible.

In the first diagram the MAS-M program package is divided into two main parts--the monitor and the applications programs. The monitor is the nucleus of the program package, establishing a link between the terminal--that is the user--and the applications programs, and between the applications programs and the stored data. The applications programs can be divided into elements according to the enterprise function surpported. The second diagram shows the elements of the MAS-M program package and the links among them. We have the right to use 11 of the elements depicted. The Hoskyns firm is expected to complete development of the delivery-organization element in 1984; we did not purchase the payroll element because of different tasks.

The MAS-M completely covers commercial or enterprise management functions. Its elements can be used independently also. Thus it is possible to introduce the several subsystems at different times as a function of enterprise applications needs or possibilities. In the following we will summarize the chief characteristics of the several elements, without trying to be complete.

Order Processing

This element accepts and tracks the orders of customers and is usually used together with the inventory control element. It ensures that bills of delivery are printed only if the corresponding warehouse inventory is available. It passes the data on the consignment delivered to the accounting element. The chief characteristics of the element are:

--online data input with a data check possibility;
--storing the solvency of the customer, indicating orders exceeding this;
--handling partial deliveries;
--a possibility of applying special prices broken down by commercial relationship, product and customer;
--adjusting warehouse inventory to orders;
--preparing bills of delivery;
--online query possibility.

Invoicing

Usually the order processing and the recording of customer accounts are used together. This element can be used independently also; in this case we can compile invoices with online data recording and can print them out. The chief characteristics are:

--online data input to produce invoice head and batch lines;
--preparing invoices on the basis of data from the order processing element, with batch processing;
--a possibility of using special invoice forms;
--handing data on to the accounts receivable element.

Accounts Receivable

Up-to-date storage of current accounts of customers on the basis of data from the invoicing element or on the basis of online data input. Continual collection of all sales. The chief characteristics are:

--nine different account books can be maintained;
--continual maintenance of account balances;
--online recording of (cash) payments, displaying new balance on the screen;
--automatic recording of discounts tied to time of payment;
--preparing account extracts, transfer notices and payment reminders;
--indicating lapsed claims;
--possibility of online query.

Inventory Control

This element makes possible automatic reorder of material working together with the order processing element or independently. Provides basic data for processing by the material requirements planning element. The chief characteristics are:

--logical grouping of inventory data to meet the needs of the several MAS-M elements with minimal disk area;
--maintaining inventory data in the conversational mode;
--recording unsatisfied needs and expected arrivals, automatic initiation of new acquisition orders;
--an inventory management strategy based on ABC analysis and watching individual item numbers;
--indicating unplanned warehouse movements;
--showing daily movements;
--printing material movement orders by order of warehouse sites;
--determining reorder points;
--indicating future development of inventory taking into consideration arrivals and demands available.

Inventory Accounting

Describes the data of the inventory control element:

--ABC analysis. Printing item numbers in order of decreasing trade value. Break points can be given in value or percentages. Preparing a new order in the event of changes in trade or acquisition price;
--calculating the value of warehouse trade;
--indicating the value of warehouse inventories and expected changes in it.

Material Requirements Planning

Conversational mode requirements planning. Recording the chief units (products) on a time horizon. Calculating parts needs on the basis of family trees contained in the bill of material element, with the possibility of manual intervention by level. Further characteristics are:

--tracking the development of parts balances. Automatic warning in the event of lack of a safety reserve or surplus inventory. Determining the useful reorder units as a function of delivery time limits;
--scheduling acquisition ordering of parts needed for units to be manufactured;
--automatic replanning of material requirements for manufacturing orders not yet released in the event of changes in bills of material (family tree).

Bill of Material

Determining the product structure (family tree). The characteristics are:

--online data input;
--complete breakdown of the chief unit with batch processing;
--breakdown by level by online query;
--printing the places of parts use (installation).

Purchasing

Recording purchase orders. The element is linked to the inventory control and accounts payable elements, but it works independently also. The characteristics are:

--online recording of purchase orders, data checking;
--automatic selection of preferred shippers;
--handling allocation orders;
--comparing arriving deliveries with orders;
--comparing accounts of shippers with accepted fulfillments;
--evaluating fulfillment of shippers (time limit, quality) by product.

Accounts Payable

Keeping up-to-date the claims of shippers on the basis of data from the purchasing element or on the basis of online data input:

--bookkeeping for accounts and credits;
--suspending disputed accounts;
--printing payment notices;
--analyzing claims;
--maintaining purchase orders according to the enterprise section placing the order.

General Ledger

Bringing together data from the accounts receivable element and the accounts payable element in the course of batch processing. Online data input for other bookkeeping items:

--keeping accounts of financial and statistical data;
--a 24 character account number, which can be broken down into optional subaccounts;
--possibility of issuing estimates by account;
--statistical indexes (for example, manufacturing capacity, number of workers);
--automatic double entry bookkeeping;
--costs analysis;
--preparing balances.

Fixed Assets

Keeping records on fixed assets, recording changes online. Calculating amortization. Direct contact in the batch mode with the general ledger element.

The elements of the MAS-M contain 140 jobs, which involve 290 programs. The number of source language lines is 265,000 (BASIC-PLUS-2).

8984
CSO: 8125/1586

SOCIAL, ECONOMIC BENEFITS OF IMAGE PROCESSING

Budapest SZAMITASTECHNIKA in Hungarian No 10, 1983 p 6

/Article by Dr Laszlo David: "Socio-Economic Utility of Image Processing"/

/Text/ Computer processing of visual infomration, that is of pictures, has been a very swiftly developing area of computer technology applications throughout the world in the past decade. Many sorts of needs require a development of image processing, among others material testing, medical science, biology and--as one of the most significant--remote sensing of the surface of the earth from space devices. Image processing as a procedure makes possible the use of remote sensing of the surface of the earth in the area of discovering natural resources.

The development and use of image processing began from several directions in our country also and can look back on a longer or shorter research and development or applications past in various professional areas. (According to our information research and development connected with image processing is being done here by the JATE /Attila Jozsef Science University/, KFKI /Central Physics Research Institute/, MTA SZTAKI /Computer Technology and Automation Research Institute of the Hungarian Academy of Sciences/ and the SZKI /Computer Technology Coordination Institute/.--The editors.) In recent years one of the most significant movers of domestic development of it has been the Council of Ministers' resolution at the end of 1979 which dealt with starting a regular domestic service for earth surface remote sensing information, on the one hand, and with beginning institutional use for economic purposes of information collected by cosmic devices, on the other.

On the basis of this the most important tasks of the present 5-year plan in the area of economic use of earth surface remote sensing information are the following:

--starting an experimental service for cosmic earth surface remote sensing information for domestic users so that the service should be systematic beginning in 1986;

--beginning institutionalized use of remote sensing information in a few economic branches so that by 1986 conditions will develop for the realization of broad economic use;

--creating those digital and analog image processing and evaluating device systems which are basic conditions for starting the experimental, and later systematic, service, for the preprocessing necessary for this, for developing the interpretation methods indispensible for using it and for institutional use of it;

--development and experimental application of interpretation methods for use, especially in the designated test areas (for example, the Balaton and its watershed, the Kiskore reservoir and the area affected by it, the Altaler watershed and environs, the Velence Lake, etc.);

--creating and developing institutional receptivity of the potential using branches, training the experts necessary to make use of it and increasing the number of interested institutions;

--exploiting the possibilities in international cooperation for fulfillment of the above goals and developing institutional international cooperation in this area also.

Image processing is one of the indispensible conditions for fulfillment of these goals. Fulfillment will require a significant expenditure from the national economy, which will be returned in essence in the course of later plan periods. Thus the strategy followed in the economic utilization of earth surface remote sensing is basically a double one. On the one hand it absolutely prescribes ever broader use of existing information (space and aerial photographs, reference data, etc.) and devices. On the other hand it prescribes the coordinated realization of the development of new devices and the collection and acquisition of new information, based on the former.

Realization of the goals is being guided and supervised by the interministerial Remote Sensing Coordination Committee. The chief of this is a deputy chairman of the OMFB /National Technical Development Committee/ and the members are high level representatives of the affected branches and organizations (for example, the Ministry of Industry, the Ministry of Defense, the Ministry of Agriculture and Food, the National Meteorological Service, the Ministry of Construction and Urban Development, the National Water Affairs Office, the Intercosmos Council and the Ministry of Culture). The MEM /Ministry of Agriculture and Food/ and the OMSZ /National Meteorological Service/ are responsible for obtaining, storing, preliminary processing and provision of systems and data acquired by remote sensing with cosmic devices; the IpM /Ministry of Industry/ and the OMFB are responsible for development of the tools needed to use it. The OMFB coordinates the developmental activity connected with concrete economic exploitation of the data obtained by remote sensing, in cooperation with the Intercosmos Council which guides research. The OMFB, IpM, MEM and OMSZ cooperated in preparing an Inter-Ministerial Research and Development Program to carry out the tasks and provide the necessary material assets; a Remote Sensing Program Office was established within the framework of the OMFB, with the participation of the supplying organizations, to guide the program.

The following tasks were fulfilled in the first years of the 5-year program outlined. The initial technical-organizational possibilities for acquisition

and limited provision of data obtained by cosmic remote sensing of the earth surface have been established. The Geodetic Institute of the National Geological and Cartographic Office of the MEM and the Central Forecasting Institute of the OMSZ established contact with the foreign (Soviet and Western European) remote sensing information centers. In the OMSZ they regularly obtain the analog photographs of meteorological artifical satellites. From time to time they inform the domestic institutions interested (at present about 100) about the information materials available and in case of need they provide them with the information requested. Meteorological (METEOSAT, METEOR, TIROS, etc.) and resource research artificial satellite pictures (Salyut, Kosmos, Landsat, etc.), and digital data are available already in considerable quantity. Of the large volume of special aerial photographs we should stress the black and white normal and infra and the color and infracolor aerial photographs which are prepared in single or multiband form partly with surveying cameras and partly with hand cameras. Multiband aerial photographs prepared with the MKF-6 camera are accessible in large quantities.

Acquisition and development of the interpretative processing and evaluating tools needed for utilization of space and aerial photographs has begun. Relatively well equipped photo laboratories, optical devices and instruments expressly for interpretation, traditional photogrammetric evaluating instruments and equipment for manipulation of multiband pictures (image synthesizers) for analog image processing and interpretation are available already. The tools needed for digital image processing are now being developed. Development of a digital image processing prototype system based on a TPA 11/40 computer is essentially complete. Along with development limited use is being made of this by the providers (the Geodetic Institute and the Central Forecasting Institute) and a few of the users (for example, the Geographic Sciences Institute, the Water Management Institute and the Water Management Scientific Research Center). At the FOMI /Geodetic Institute/ they have developed an image processing program system for Honeywell and DPD computers, linked to Coloration image digitizing equipment. The processing tools now available make possible basically applications experiments; a further increase in the capacity of the systems is needed for wide-scale operational use.

Of outstanding importance from the viewpoint of use is the 2-year remote sensing engineering course organized at the Budapest Technical University, which greatly aids the institutional development of receptivity. The training of remote sensing experts is an important element of the course.

Along with the development of providing images and of image processing tools the development and experimental use of interpretative (evaluating) methods have begun also. This also is a fundamental condition for the economic utilization of remote sensing.

The editors of SZAMITASTECHNIKA wanted to help this developmental process by reviewing the development and present status of domestic digital image processing device systems and their use in a special issue. This review extends beyond earth surface remote sensing developments and examples of economic utilization through a description of the most important theoretical foundations of image processing to medical science, industrial, manufacturing and materials testing

research and development and applications, emphasizing the social and economic significance--which, perhaps, can hardly be measured today--of digital image processing as an applied computer technology procedure.

Although this review is far from complete and bears within it the childhood diseases of an activity just getting started (for example, the Hungarian equivalents of the special terms are not yet completely developed) still it reflects the current domestic developmental thinking and applications possibilities and offers a glimpse into the various research, development and user workshops. Thus, we hope, we will help to inform the interested reader about work in other special areas which may be useful to him and we will contribute to awakening new ideas in a new area for the application of computer technology.

8984
CSO: 8125/1586

METHODS, APPLICATIONS OF IMAGE PROCESSING

Budapest SZAMITASTECHNIKA in Hungarian No 10, 1983 pp 6-7

/Article by Dr Miklos Hajal: "Measuring Visual Information"/

/Text/ A small research group at the Process Control Faculty of the Budapest Technical University has been dealing with various areas of form recognition and image processing since 1973. Initially--lacking tools--we processed the professional literature, systematized procedures and adapted and developed further some procedures. The hardware development which began in 1974 made it possible to develop new procedures, solve concrete applications tasks and--as an independent theme--develop various general purpose and special image analyzing systems.

The research results and experimental experiences had an important role in instruction and in postgraduate training from the beginning.

Tools

Thus far we have developed eight systems with various functions and of various designs for image processing. Without exception they use industrial television cameras of the Signal Technology Cooperative as the input unit. The IPS-01 two level digitizer and coder and the IPS-02 two level digitizer are peripherals connected to the internal data channel of TPAi computer. The spatial resolution of both devices is 144 x 192 pixels. The resolution of the IPS-03 is 288 x 384 pixels with 8 gray levels, a TPAi peripheral with its own buffer storage. The IPS-04 plays the role of the "eye" in the intelligent robot experiments of the MTA SZTAKI /Computer Technology and Automation Research Institute of the Hungarian Academy of Sciences/, as a peripheral of an ES 1010 computer with its own handling organs, memory and analog/digital display. The picture can be segmented and "zoomed" electronically. (The individual parts of the stored picture--parts of size 1/2n--can be "enlarged" electronically.) Its maximum resolution is 576 x 768 pixels with 16 gray levels.

The IPS-05/06 is an autonomous microprocessor image processing system made at the request of the Ministry of Health; it has its own RAM and EPROM store. Its peripherlas are: ASCII pushbutton line, alphanumeric display, analog/digital monitor and display, a pseudo-color display and peripherals to handle input data carriers (printed forms, registers, transparencies and reflexive pictures).

It is programmable and the programs can be called on the basis of a list or chained. The 05 is connected to an HP85 and the 06 to an LK4 magnetic cassette unit. Its resolution is the same as the 04; window generation and the addressing of windows are optional.

The IPS-07 is a developmental version of the 05/06 with an FMSZT monitor, VT340 or Orion display, tape punch and reader. The IPS-08 is a VIDIMET-MICRAS image analyzer prepared for VASKUT /Iron Industry Research Institute/, a further developed version of the 07, with floppy disk, printer and microscope control possibility.

In the final form the operating system is floppy disk oriented and the assortment of user programs is rich. It contains geometric, topological and statistical analysis procedures, filtering, gray level manipulations (for example, adaptive thresholding), Walsh and Fourier transformation, etc.

In addition, linked in part to the image processing systems, we developed a pseudo-color display and a color quasi-graphic raster display. In both devices we used elements of the TR 80/85 microprocessor system developed by the faculty.

Theory

The development of image processing systems made possible an extension of the theoretical studies. We are dealing with the following themes: preprocessing, essence accentuation, target oriented picture analysis, form and texture recognition, complex and incidental procedures. Without trying to be complete we should mention a few procedures adapted, further developed or developed by us.

Preprocessing: digital filtering in the picture area, gray level manipulations, for example histogram transformation, deterministic and adaptive thresholding, shading correction, and edge detection with digital gradient generation.

Essence accentuation, image analysis: Karhunen-Loeve transformation, accentuating topological characteristics, digital geometry, geometric-topological descriptors, template matching methods, 2-D Walsh and Fourier transformation and spectrum, first and second order statistics interpreted in the primary picture area and gradient field, first and second order local statistics for separation of gray levels and micro-edges, discriminant and principal component analysis.

Recognition, classification: linear syntactic form recognition with differential partitioning of the chain code, statistical decision theory classification with the Mahalanobis distance as the degree of similarity, recognition of complex forms in the associative mode.

Complex and incidental procedures: use of fuzzy calculus in verifying and decisionmaking procedures, analytical and phenomenological study of the interdependence between macroscopic and microscopic properties, parallelism of image processing procedures, heuristic procedures.

Of these the results achieved in the areas of geometric-topological analysis, second order local statistics, spatial transformations and fuzzy procedures are those which primarily have been published and recognized in international forums as well.

Applications

In the area of practical application of the several devices and procedures we do our work jointly with researchers of other institutions.

Medical-biological applications--cytology or karyometry: classification of cell nuclei with the fuzzy procedure; carciopulmonary diagnostics: evaluation of high speed films of the heart with heuristic methods, study of heart shadows on screen pictures, classification of EKG curves with the matching method; cancer research: classification of tumor cells with chromosome recognition; neurology: demonstration of vegetative neurosis through integrothermograms; patient recordkeeping: automatic processing oa anamnesis and statistical forms; virology: study of electron miscroscope virus pictures.

Metal structure research--evaluation of the results of macroscopic mechanical-technological studies, classification of microscopic texture picutres with statistical methods (fast steels) or geometric-topological methods (cast iron), determining the interdependencies of mechanical-technological properties and microscopic image characteristics, replacing subjective classification with fuzzy recognition.

Robots--recognition of simple flat or solid forms, contact sensing.

It is a common aspect of the variety of work done in the area of systems, theory and applications that in every case the goal is to acquire, convert to numbers and measure the visual (graphic) information (that is, tobreak down the qualitative characteristics into quantities). In this regard image processing can be regarded as a special--multidimensional--branch of measurement technology which provides complex information, similar to the sensing system of the human eye, for the central processing unit of a diagnostic or quality control system--and, naturally, for human beings.

The efforts of the faculty in this area have been recognized by academic prizes, numerous dissertations and publications and various forms of international recognition. All this is important, because this is the only faculty in the country where systematic training in image processing takes place, making it possible for the students to join in the research and development work. We are striving to increase the effectiveness of this work and to expand the practical applications.

Az IPS rendszerek általános vázlata

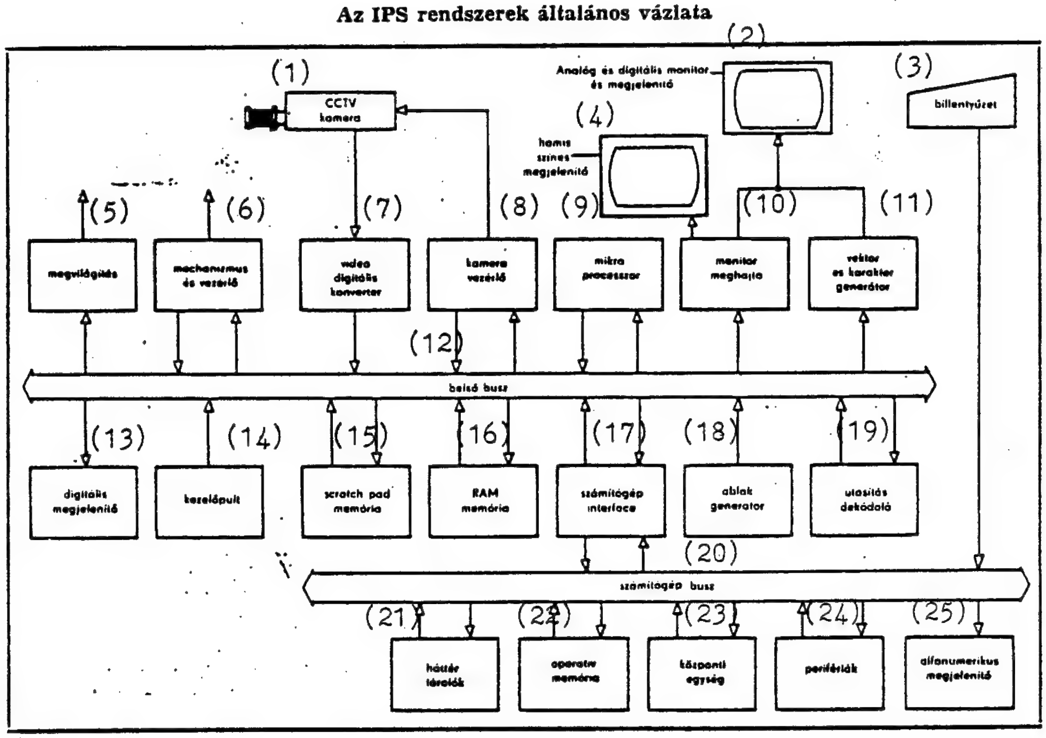

Figure 1: General Diagram of the IPS Systems

Key:

1. CCTV camera
2. Analog and digital monitor and display
3. Keyboard
4. Pseudocolor display
5. Illumination
6. Mechanism and control
7. Video digital converter
8. Camera control
9. Microprocessor
10. Monitor drive
11. Vector and character generator
12. Internal bus
13. Digital display
14. Control panel
15. Scratch pad memory
16. RAM memory
17. Computer interface
18. Window generator
19. Instruction decoder
20. Computer bus
21. Background stores
22. Operating memory
23. Central unit
24. Peripherlas
25. Alphanumeric display

Figure 2: Image of Metallographic Section During Processing

8984
CSO: 8125/1586

MICROCOMPUTERS IN HUNGARY

Budapest FIZIKAI SZEMLE in Hungarian, No 9, 1983 pp 336-341

[Article by Istvan Mezgar, Machine Industry Technological Institute, Budapest: "Microcomputers in Hungary"]

[Excerpts] 2. Microcomputer in Hungary

2.1 Developmental Trends of Computer Technology

In the second half of the 1960's in Hungary the programs were prepared determining the development of computer technology on which results today were based. For example, the OTTKT [National Long-Range Scientific Research Plan] target program K-3 started in 1971 and in the first period the chief emphasis was placed on development of computers and peripherals. The period 1976-1980 was characterized by an increase in the number of computer technology applications involving R and D tasks. The basic goal of the Computer Technology Central Development Program (SzKFP) was to spread computer technology culture, and within this, in the 1981-1985 action plan, special emphasis was given to the development of computerized engineering design in the interactive mode.

Since microcomputers--in addition to carrying out other tasks--are suitable for satisfying the requirements of automated technical design the variety of microcomputer types produced in Hungary is increasing more and more today.

Together with the mini and microcomputers developed and manufactured thus far, the large series manufacture of graphic devices is beginning soon also.

Price relationships, as measured by wages, hinder the wide spread of computer technology in Hungary, although the devices of domestic manufacture obtainable today are accessible even to smaller enterprises. (For example, the ratio between wages and the price of computer technology devices puts the threshold of economical replacement almost one order of magnitude higher than in, for example, Austria.)

2.2 Microcomputers Manufactured in Hungary

As a result of the explosive development of microelectronics many types of microcomputers at various stages of development have reached the market in

Hungary also, and this has caused confusion among inexperienced domestic users.

In Hungary today four ways of buying a computer are known:

1. If the customer has foreign exchange he can obtain a computer directly from the capitalist market, although this route is less and less available due to the embargo policy of the capitalist states.

2. Microcomputers of western manufacture can be purchased for forints from various sources and to a limited degree.

3. CEMA import, The assortment of microcomputers produced in the socialist countries is very narrow; import of them has not developed yet.

4. Buying machines of Hungarian manufacture. In the future it is expected that microcomputers of domestic manufacture will represent the--hopefully--sure supply for users.

In very many cases the design of an software supply for computers, frequently acquired by chance from various sources, are not satisfactory, so the present plenty is only apparent. At the end of 1982 there were 1,090 mini and microcomputers in Hungary--509 of them from domestic sources, 218 from socialist sources and 363 from non-socialist sources. This includes equipment sold through the Commission Department Store Enterprise and that brought into the country by private persons.

According to the estimate of experts the number of mini and microcomputers operating in Hungary is larger by about an order of magnitude than the official data indicate.

In what follows--on the basis of the accompanying table--we will provide a brief description of the microcomputers of domestic manufacure with an 8 bit word lenght in order of their increasing acquisition price.

The description does not extend to special purpose microcomputers (for example, that of Vilati-UNIPROG) which are suitable primarily for data processing (VT-20, VT-30) but will deal only with that equipment which is also suitable for carrying out S & T calculations.

The School Computer (HT-1080Z) of the Signal Technology Cooperative and the Aircomp-16 equipment of Boscoop have a 16 K byte central unit in their basic version, but this can be expanded.

A television set and cassette tape recorder can be attached to the basic unit, as display or storage element.[6] In the case of the HT-1080Z microcomputer they plan to manufacture a version to which one can connect disk and printer also.

The Mickey '80 computer of the LSI ATSZ has 32 K RAM, which can be expanded to 56 K bytes. One can connect a high frequency TV, cassette tape recorder, printer and floppy disk to the basic machine.[4] All three machines can be programmed in the BASIC language.

The Syster 8xxx microcomputer of MTA SZTAKI [Computer Technology and Automation Research Institute of the Hungarian Academy of Sciences] was developed to carry out special tasks but it is also suitable for performing technical calculations. The RAM capacity of the central unit can be expanded to 32 K bytes. One can connect a screen, V and X series modem, cassette tape recorder, printer and floppy disk.[6]

The programming languages are BASIC and Assembler.

The LABSYS-80 equipment is manufactured by the Labor MIM [Laboratory Instrument Industry Works]. The basic unit contains a screen, a memory unit expandable to 256 K bytes and a floppy disk. Additional expansion possibilities are: twin floppy, magnetic tape unit, Winchester disk (8 inch), cassette tape recorder and printer. Its operating system (MSYS) is compatible with the CP/M 2.2 The equipment can be programmed in the BASIC language.[6]

The Telephone Factory manufactures the TAP-34 microcomputer. The equipment can be operated as an intelligent terminal also on available communications channels (telephone, telegraph, physical connection). The RAM capacity of the central unit can be expanded to 40 K bytes. One can connect twin floppy, printer and modem. The screen is built in with the basic machine. It has an operating system they developed themselves. It can be programmed in the BASIC and Assembly languages.[4,6]

The EMG-777 is the newest microcomputer model of the Electronic Measuring Instruments Factory. The equipment is suitable for S & T calculations, control of measuring instruments, medium size data processing and--with a graphic expansion--two dimension graphic tasks and depiction of functions.

The 777 can be programmed in extended BASIC, it has a special operating system they developed themselves and its central unit can be expanded optionally to 144 K bytes. One can attach to it all the peripherals of the EMG 666 as well as an alphanumeric wide printer.

Screen and floppy disk are built in with the central unit.[4,6]

The M08X professional personal computer was developed by the Computer Technology Coordination Institute on the basis of a system of the Automation Faculty of the Budapest Technical University.

The central unit is made of a 25 x 80 character screen, keyboard, 64 K bytes RAM, 6/12 K bytes EPROM storage and I/O cards. The following peripherals can be attached:

--a maximum of four simple or double density one or two side floppy units,
--matrix printer,

--electric typewriter,
--plotter, and
--graphic display.

In the terminal mode the M08X microcomputer can be connected with various ESR, MSR and Siemens computers.

In the independent mode it can run programs in various assembler, BASIC, FORTRAN, PASCAL and C languages under the supervision of a CP/M compatible operating system.

Program packages which are being constantly expanded in accordance with the current user needs support use of the M08X professional personal computer.[6]

Videoton has put together the VT-20/IV configuration. Actually this involves four independent microcomputers which use a common background storage. Each work site has 64 K bytes RAM, 4 K bytes ROM and a VDN display. The common background storage consists of 2 x 2.5 M byte disk units 2nd also has 64 K bytes RAM.

The printer of the system can be connected to the disk unit.

The various functions of the software system of the VT-20/IV are divided as follows among the several hardware units. The systems handling the common resources run on the disk CPU. Every work site has a separate operating system, which uses the common resources running on the disk CPU. The user programs, which can be written in the FORTRAN, BASIC, COBOL, or PASCAL languages, are linked to the operating system at the work site.

This software structure ensures a high degree of independence of the operating sites and in the case of programs which do not use too much disk there is no considerable time difference between four-site and one-site operations.[6]

Videoton is offering to users, under OEM conditions, a PERSONAL COMPUTER MODUL, which can be operated as a microcomputer, completed with display, keyboard and background storage. The RAM capacity of its central unit can be expanded to 64 K bytes. The following peripherals can be attached to it:

--printer,
--plotter,
--floppy disk unit,
--ad hoc end-equipment.

The equipment can be programmed in the BASIC language.[6]

MTA SZTAKI is manufacturing a microcomputer called VARYTER. The total storage capacity of its central unit (RAM and ROM) is 128 K bytes. The basic system includes a floppy disk unit a 24 x 80 character screen and keyboard. The peripheral expansion possibilities are:

--printer,
--cassette tape recorder,
--punch tape reader-writer,
--graphic screen,
--serial line interface,
--analog I/O.

The operating system can be MPOS, IDOS, or ZAFIR, depending on the applications area.

The microcomputer can be programmed in the BASIC language. One can also order the ELAN 0 language for the instructional purposes.[6]

The Signal Technology Cooperative manufactures the HT 680 universal microcomputer system. The sytem is of modular construction and elements must be put together according to the task. Because of the modular construction the microcomputer can be used in an extraordinarily broad sphere.

The chief characteristics of the HT 680 microcomputer are:

--RAM memory can be expanded to a maximum of 512 K bytes,
--ROM memory can be expanded to a maximum of 384 K bytes.

Peripherals which can be attached:

--floppy and cartridge disk,
--tape recorder,
--punch tape reader-writer,
--video display,
--general serial and parallel interface,
--printer.

The microcomputer operates with HTOS monitor, peripheral handling routines and operating systems and can be programmed in the BASIC language.[4,6]

In general the performance and completeness of microcomputers with a word length larger than 8 bits are greater than those of the equipment described thus far. One 16 bit and one 12 bit computer family are being manufactured in Hungary.

The central unit of the TPA-1140/EMU microcomputer of the MTA KFKI [Central Physics Reserach Institute of the Hungarian Academy of Sciences] has a RAM capacity of 64 K words. Its operating system is RSX or some version of it. It can be programmed in the FORTRAN and BASIC languages. The price of the configuration, which contains CPU, display, cartridge disk (5 M byte) and printer is about 3 million forints.

The equipment can be operated independently or as an intelligent terminal for a TPA-1140 minicomputer, and it offers complete software compatibility with it.[4]

The MTA KRKI developed the NR-4101 (TPA-L) microcomputer family which is being made now in three versions. The TPA-L/32 (NR-4101H) can accept a maximum of 32 K words operational storage and the TPA-L/128 (NR-4101B) can accept a maximum of 128 K words of operational storage. The TPA-L/128H (NR-4101D) is a newer, high speed version of the NR-4101B.

The assortment of peripherals for the TPA-L family is very large. The chief groups of peripherals are:

--paper tape peripherals,
--magnetic tape units,
--magnetic disk units,
--communications equipment,
--terminals,
--computer connecting units.

The software background for the TPA-L microcomputers is extraordinarily rich, since the entire TPA-i and TPA-S program assortment can be run.

The following high level programming languages can be used in the course of programming: FOKAL, FORTRAN, BASIC, CAMAC-BASIC, MINIBOL, OPAL and MIDIBOL.[4]

The price varies between 3 and 6 million forints depending on model and configuration.

At present the microcomputers of Hungarian manufacture listed, suitable for carrying out S & T tasks, can be obtained on the domestic market.

By the end of 1983 it is expected that development will be completed on two microcomputers with a 16 bit word length and 128 K bytes RAM--a further developed version of the Videoton VT-20 machine and a larger version of the M08X of the SZKI (the Proper 16/A).

It is to be hoped that the price decrease for microcomputers which can be experienced world-wide will take place in Hungary also since, for example, the price of the HT-1080Z was still 80,000 forints in December 1981, 70,000 forints at the beginning of 1982, 58,000 forints in the first half of 1983 (with TV set and cassette tape recorder), and is expected to be 48,000 forints in the second half of the year.

3. Buying a Microcomputer

Before acquiring a microcomputer one should analyze the tasks to be solved from the viewpoint of whether the microcomputer is a suitable device for handling them.

There are typical cases where it is unambiguous that a microcomputer is not suitable for solving the task. A few examples:

--Handling large volumes of data,
--Need for high operating speed,

--Special software requirements (for example, simulation),
--The user does not want to master any sort of programming knowledge.

If it is decided unambiguously that a microcomputer is suitable then the next step is to select suitable equipment. Here one can take into consideration individual points of view, such as expandable RAM, the peripherals which can be connected, the software assortment, etc., but in any case one should carry out a matrix evaluation in the course of which adding up the points will establish an unambiguous order for the selection. The importance of the several evaluating factors for the user can be expressed with a weighting factor on a scale of one to ten; then the level of the equipment being evaluated can be written in a value column for the parameter being considered. The following qualifying point system is recommended so that real differences will be shown for the total points for the several devices:

0--cannot be evaluated
1--not satisfactory
5--adequate
7--good
10--outstanding.

The values are multiplied by the weighting factors, then the weighted values for the several factors are added to give the total number of points for the device.

A researcher or planner can no longer do without a computer if he wants to do his work at a high level. In very many cases a microcomputer is sufficient to carry out the tasks; because of its human proximity it gives greater "power" to its user--there is no separate operator, computer center or programmer. Because of the direct contact not only does the quality of the work improve, the quality of the "worker" improves also, since the machine teaches him attention, precision and discipline.

These advantages of the use of a microcomputer justify the effort to see that easily used, modern microcomputers are manufactured in Hungary also; otherwise their domestic spread and use in ever broader circles cannot be ensured in the future.

The survey of microcomputers of domestic manufacture was prepared in the Manufacturing Planning and Organization Research Main Department of the Machine Industry Technological Institute since we could not find such a catalog--as far as we know none exists--prior to realizing our intention to purchase one we felt it useful to know what the market offered. By publishing the material we have collected we want to offer our help in giving information on microcomputers of Hungarian manufacture to those who would like to do their research and planning work more quickly and at a higher level with the aid of a computer in this category.

(Collection of material for the article was completed on 31 March 1983.)

Table: More Important Data for Microcomputers of Domestic Manufacture With An Eight Bit Word Length

4. táblázat

Nyolc bit szóhosszúságú, hazai gyártmányú mikroszámítógépek fontosabb adatai

(1) Típus	(2) Gyártó	(3) µP típus	(4) Operációs rendszer	(5) RAM kapacitás (Kbyte)	(6) Programnyelv	(7) Alapkonfiguráció	(8) Alapkonfiguráció ár (eFt)	(9) Opcionális perifériák
1. Aircomp-16	Boscoop Personal GT	Z80A	–	16	BASIC	Klaviatura CPU (16K) (10)	27	TV-készülék (12) kazettás magnetofon (13)
2. Mickey '80	LSI	Z80	–	16–56	BASIC	Klaviatura CPU (16K)	34	TV-készülék kazettás magnetofon, nyomtató
3. School Computer (HT 1080Z)	H. T.	Z80	–	16	BASIC Assembler	Klaviatura CPU (16K)	40	TV-készülék kazettás magnetofon
4. Aircomp-32	Boscoop Personal GT	Z80	–	32	BASIC	Klaviatura CPU (32K)	40	Floppy, nyomtató, TV-készülék kazettás magnetofon
5. SLK-80	BRG	U 880	MSYS	32	BASIC FORTRAN COBOL	Klaviatura TV készülék kazettás magnó (CPU 32K)	75	
6. Syster 8	SZTAKI	Z80	–	16–32	BASIC ASSEMBLER	Klaviatura display CPU (16K)	80	Kazettás magnetofon floppy diszk, nyomtató MODEM
7. SLK-80/A	BRG	Z80	MSYS	64	BASIC FORTRAN COBOL	Klaviatura display kazettás m., CPU (64K)	183	Floppy diszk, nyomtató, mágnes v. lyukszalag egység, rajzgép (17) (16)
8. TAP-34	Telefongyár	Intel 8080	(26) Saját fejlesztés	8–40	BASIC Assembler	Klaviatura display CPU (8K)	171	(15) Nyomtató, duál floppy, MODEM
9. HT 680X	H. T.	6800	HTOS	64–512	BASIC	Klaviatura display CPU (32K)	194	Floppy és cartridge diszk, lyukszalag író–olvasó, video display, nyomtató (18)
10. Labsys 80	Labor MIM	Intel 8080	MSYS (CP/M 2.2)	64–256	BASIC	Klaviatura display floppy, CPU (32 K)	260	Nyomtató, Winchester diszk, (19) kazettás tároló, mágnesszalagos egység (20)
11. VIDEOTON Pers. Comp.	VIDEOTON	Intel 8080A	Saját fejlesztés	64	BASIC	Klaviatura display ikerminifloppy CPU (16K)	260	Nyomtató, plotter, egyedi végberendezések (21)
12. MOD-81	MEDICOR	Z80	CP/M és MP/M kompatibilis	64–512	BASIC PASCAL CLSP, makro ASM	Klaviatura display floppy, CPU (64K)	330	Nyomtató, ikerfloppy, diszk (2×2,5 MB)
13. MO8X	SZKI	Z80	CP/M kompatibilis	64	BASIC, C FORTRAN PASCAL	Klaviatura display, CPU (64K) ikerfloppy (14)	440	(22) 4 db floppy egys., mátrix nyomtató, Teleterm, Teledata grafikus display, vill. író. (23)
VT-20/IV 14. Varyter	SZTAKI	Z80	MPOS IDOS ZAFIR	RAM + ROM 128	BASIC CLANO	Klaviatura display ikerfloppy, CPU (128K)	460	Nyomtató, kaz. magnetofon lyukszal. író–olvasó, grafikus képernyő, Analóg I/O (24)
15. EMG 777	EMG	Intel 8085	Saját fejlesztés	128 (felhasználói)	BASIC	Klaviatura display, floppy CPU (128K)	841	Nyomtató, duál floppy, Plotter
VT 20/IV 16. rendszer	VIDEOTON	Z80	Saját fejlesztés	64 Munkahelyenként	FORTRAN BASIC, COBOL, PASCAL	lásd: opc. perif. (11)	3.140 (komplett rendszer)	(25) 4 Munkahely (4×64 K) + nyomtató + 2×2,5 Mbyte diszk

Table: More Important Data for Microcomputers of Domestic Manufacture With An Eight Bit Word Length

KEY:

1. Model
2. Manufacturer
3. Microprocessor type
4. Operating System
5. RAM capacity (K bytes)
6. Programming languages
7. Basic configuration
8. Price of basic configuration (1,000 forints)
9. Optional peripherals
10. (Klaviatura)--Keyboard
11. See optional peripherals
12. (TV keszulek)--TV set
13. (Kazettas magno ct. for)--Cassette tape recorder
14. (Iker)--Twin floppy
15. (Nyomtato)--Printer
16. (Lyukszalag egyseg)--Punch tape unit
17. (Rajzgep)--Plotter
18. (Lyuksz. iro-olvaso)--Punch tape reader-writer
19. (Kazettas tarolo)--Cassette storage
20. (Magnesszalogos egyseg)--Magnetic tape unit
21. (Egyedi vegberendezesek)--Ad hoc end-equipment
22. (4 db)--4 each
23. (Vill. irog.)--Electric typewriter
24. (Grafikus kepernyo)--Graphic screen
25. (Munkahely)--Work site
26. (Sajat fejlesztes (in operating systems column)--Their own development

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LAGGING DEVELOPMENT OF BIOTECHNOLOGY DESCRIBED

Warsaw ZYCIE WARSZAWY in Polish 4, 8 May 84

/Article by Bozena Kastory: "Take a Bacterium, Add a Gene..."/

/4 May 84 p 3/

/Excerpt/ The FRG government apportioned 67 million marks for biotechnology research last year.

West German industry spent four times as much on this type of research. Great Britain's industrial ministry allotted 16 million pounds for the development of biotechnology methods in 1982.

The French Government provided for the expenditure of 9 billion francs on its biotechnology program.

In Japan, 25 billion yen was earmarked for research in genetic engineering over the next 10 years.

Canada has abolished immigration restrictions for specialists in this field.

Hungary intends to expend 720 million forints and 14 million dollars on 7 years of basic research and 4-6 billion forints on industrial applications of biotechnology.

To date, virtually no steps have been taken in Poland to launch work within the area in question.

(These notes are extracted from "Biotechnologies," an expert evaluation prepared by a PAN task force in March 1984.)

According to the report "Biotechnologies," prepared by six PAN committees, "the worldwide biotechnological revolution has found Poland virtually unprepared."

A scarcity of personnel, a scant financial support base, and lack of equipment and reagents are coupled with a shortage of professional literature and the absence of a proper system for organizing research work and transfer of results for industrial application.

Several dozen Polish scientists recently spent some time reflecting on what to do and how to start because Poland cannot simply turn its back on this revolution, which is encompassing such countries in dire financial straits as Mexico, India, and Argentina.

In the next segment, I will present the views, plans, and proposals concerning this issue.

/8 May 84 p 3/

/Text/ "Poland is among the few countries in which a living organism, including organisms with artifically altered genetic traits, is not subject to patenting.

"The patent office of the Polish People's Republic, however, is now in possession of more than 100 patents in genetic engineering and biotechnology submitted for examination from abroad.

"Outside of Poland, patent protection now extends to live cells that differ from those existing naturally, methods leading to the formation of genetically modified organisms, and technological processes in which such organisms or their component parts are used.

"The highest number of patents were submitted in the United States; some come from CEMA countries, primarily the Soviet Union."

This information was extracted from the "Biotechnologies" report prepared by a PAN task force composed of six committees: biochemistry and biophysics, microbiology, food chemistry and technology, chemical engineering, experimental therapy and chemical sciences.

The report includes two parts, one demonstrating the rapid growth of biotechnology worldwide, and the other revealing a depressing absence of this discipline and its applications from Poland.

An Outpour of Ideas

Except for microelectronics, the world currently knows no other area shared by industry and science that has a comparable rate of progress. In Western Europe, Japan, the United States, and the Soviet Union as well, there is a veritable explosion of innovative ideas, along with furious work to get ahead of others, to lure the best brains to richer companies with the flow of money that newly established firms obtain even before they register their first successes, so strong is the belief that genetic engineering, with its companion production techniques, will top the chemical methods applied until now in industry.

For instance, when the American Genentech Company issued its shares in October 1980, it was welcomed as the most sensational offer of stock in the last decade. On the morning of the first day of sales, the rate was $35 per share and reached $85 in the evening. That interest in its entirety was, therefore, based only on anticipated future results. Those hopes proved to be correct. A year later, the company's expenditures were 17 million dollars and its profits 30 million dollars.

Let us refer all this to the chances of biotechnology in Poland. I selected three fields: pharmaceutical industry, where extensive use of genetic engineering originated; chemistry, which is giving birth to an industry totally different from the chemical industry known over the past centuries; and the protection of waters, a field in need of rescue, especially in Poland.

No. 1--Medication

A large number of medically important substances are proteins. Their synthesis in the body depends on particular genes. Those genes can be transferred into microorganisms, causing them to intensify the production of human insulin, growth hormones, antigens, interferon, and enzymes.

According to the report, "The Polish pharmaceutical industry's interest in the development of genetic engineering methods to manufacture medications is negligible. The lack of initiative on the part of the industry is due to its feebleness in comparison with similar industries in other countries."

Furthermore, "a comparison of the quality of personnel, technical equipment and production techniques utilized in pharmaceutical factories abroad with those available in Poland produce the impression that a computer manufacturing plant is being compared with a village blacksmith's shop."

No. 2--Chemistry

Biotechnical engineering in the chemical sector amounts to a virtual revolution. Until recently, man used the chemical methods to process iron ore, whether by smelting, gasification, or refining. These methods require high temperatures, pressure, and power.

The smallest living cell is, however, a much better processing plant. It needs no high temperature and operates at regular pressure, using a minimum of energy.

Moreover, identical chemical reactions proceed millions or even billions of times faster in a live molecule than they do in huge processing plants. Nature has devised reaction accelerators which engineers are unable to

produce. Enzymes are capable of restructuring the electron shells of atoms in a manner causing even the most resistant ones to bond and separate many times more rapidly than they would in the absence of enzymes.

Biotechnology in industry is likely to turn out to be a discovery to match the first iron smelting furnace, which ushered in the era of iron, steel, railroads and automobiles.

At a PAN Presidium meeting last month, Prof Boguslawa Jezowska-Trzebiatowska commented on Polish patented methods for ore enrichment and processing with enzymes. For instance, copper is obtained with metal-processing enzymes from low-content waste in the retention tanks of the Lubin copper plant. That is, however, a small-scale effort. The introduction of biological methods into Polish industry is hampered by a lack of basic knowledge on mircoorganisms utilized in metallurgy, by the inability of biologists, engineers, chemists and geneticists who must collaborate in this field to find a common language, and by the lack of information on the consequences produced in the natural environment by the introduction of new microorganisms that never existed before. "In view of this," the authors of the report conclude, "the application of biotechnological methods in engineering in Poland should be postponed until some time in the future."

No. 3--Water Prctection

In community and industrial sewer systems, mechanical and biological purification continues to leave noxious substances that no longer can be removed by conventional methods. These substances penetrate to the surface waters. Most of these substances are mutation-causing or carcinogenic compounds that accumulate in tissues and endanger human health. These compounds should be identified and prevented from penetrating reservoirs of surface water, which is not being done in Poland.

Approximately 90 percent of the wastewater in our country is composed of organic substances that can be removed by biological methods. The existing water treatment plants, by far too few, would be able to remove 10 percent of those pollutants if they were functional. Most of them, however, are malfunctioning or out of order, so, in practice, sewer water is virtually untreated. Yet, by using genetic engineering, it would be possible to attempt to produce bacteria strains capable of decomposing almost all compounds.

Several scientific institutions in Poland are investigating the activity of bacterial enzymes that decompose such substances as phenols or carcinogens. Most of that research, however, has found no application primarily because of the lack of basic investment in water protection.

What Next?

The entire report on biotechnology was prepared to find an answer to this question. Should we turn our backs to what is going on elsewhere in the world, or should we select a sector in which we can excel, then train personnel and develop industry in it?

Here are several comments made at last month's PAN Presidium meeting, which discussed the report.

Dr Wieslaw Szelejewski, director of the Pharmaceutical Industry Institute: This is the 10th biotechnology session in which I have taken part. Each session ends in the appointment of another commission. I see no chance for the industry to give direction to research on its own. This requires major funding. Moreover, a plan of economic development, even if only until 1990, is not in existence. The conclusion is that biotechnology must be a centrally directed research program. In my view it must be a governmental program.

Prof Waclaw Gajewski, chief of Warsaw University's Genetics Institute, one of the few Polish institutions using genetic engineering methods: Companies intent on basing their existence on biotechnology are proliferating in the world. It is obviously a profitable field. Major firms commit themselves to it in the certainty that in 10 years it will be a source of income. Will things again wind up in this country with nothing but a PAN blessing? With no funding and no program?

Prof Piotr Weglenski, one of the authors of the report: No institution subject to PAN or to the Ministry of Science can afford to replace the research techniques with more modern ones. The situation is miserable even with regard to information about the techniques used abroad. Among the 30 new periodicals that began publication in the past 5 years, not a single one is brought to Poland.

Prof Wladyslaw Dobrzanski, microbiologist: The development of biotechnology should be directed by a commission or a task force appointed by the government. A commission of this sort would make decisions on the selection of lines of research and provide information to appropriate elements in the government, the economic establishment, and society. Basic research, the establishment of centers utilizing biological engineering techniques, access to international collections of strains of microorganisms, tissues, subsidies to industry and personnel training are necessary.

Prof Jan Kostrzewski, PAN president: We cannot simply conclude by appointing yet another committee, convene again in 2 or 5 years, and then learn again what is going on elsewhere in the world, cognizant at the same time of how little proceeds in our own country.

We must address the PAN scientific secretary to have all of this translated, with the participation of all of PAN divisions, into the language of practice so that we possess a specific action program.

Prof Zdzislaw Kaczmarek, PAN scientific secretary: This could be done, provided new resources are released, because the available ones are insufficient even for the existing programs. Many PAN institutes are out of funds to assure their continued existence even now, a year and a half before the end of the 5-year plan.

There were no comments from representatives of the ministries and the Planning Commission. Though invited, they failed to come to the session. We cannot make a decision on whether biotechnology should be ranked as a governmental program, a key program, or any other type of program, since we do not know the plans for the economic development.

It would appear that some method must exist for resources expended on brain work to yield profits higher than the initial input. If a method of this kind were lacking, the world would still be back in its medieval stage. Yet the 21st century is forcing itself upon us. Examining the Polish science and economy, it appears that such a method has not yet been devised for our use.

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CSO: 2602/33

EFFORTS TO INCREASE SUPPLY OF NON-METAL-BEARING ORES

Bucharest MINE, PETROL SI GAZE in Romanian Jun 84 pp 270-273

[Article by engineer Dr I. Fodor, director of the Institute of Mining Research and Design for Non-Metallic Substances, at Cluj-Napoca: "Achievements and Perspectives in Supplying the Economy With the Necessary Amounts of Non-Metallic Products"; based on a report presented at the symposium "New Achievements in Scientific Research, Technological Development and the Introduction of Technical Progress in the Ore Extraction Industry," held at Cluj-Napoca on 22 December 1983]

[Text] The continuation of our country's economic-social development process at a high rate is decisively influenced by the growth of the production of mineral raw materials and by the more complex, complete and efficient use of our own resources of useful mineral substances.

In socialist Romania, the industrial branches that consume mineral raw materials have recorded over the last 2 decades annual development rates of between 8 and 14 percent, which has also required a corresponding increase in the necessary amount of materials. These development rates in the basic branches of the economy - chemicals, metallurgy, machine building, light industry, construction materials and so forth - were characterized by the continuing improvement and diversification of products by way of obtaining new substances, materials or products having new qualities and properties compared to previously known ones. Thus, in addition to a corresponding growth in the production of coal, ores and useful mineral substances, in the case of non-metallic ores our economy - in a full stage of development - also called for obtaining new products and new varities and for having an extremely broad diversification of existing products.

A good part of the non-metallic products required by the economy was supplied from our own producttion, but there are still numerous substances and varieties that we must import.

Within the framework of the Ministry of Mines - the main producer of non-metallic substances and useful rocks - as well as within the other ministries which exploit deposits of non-metallic substances, the appropriate importance has been given from year to year to the growth of production, the improvement of the quality of the products and to the diversification of these products in accordance with the needs of the national economy.

Among the measures that have been outlined, important amounts of funds and resources have been allocated for geological and technological research.

New deposits of non-metallic ores have been discovered, technologies for obtaining and using these ores have been created and numerous modern production units have been developed which are equipped with technological facilities having high capacities, productivity and selectivity.

According to the particular nature of our deposits, which, in general, have low levels of useful components, the process of obtaining mineral products of the quality and characteristics required by consumers requires the extraction industry to use complex technological processing, with this, thus, requiring as an objective requirement the development of a specialized base for technological research and design, a function fulfilled by the Institute of Mining Research and Design for Non-Metallic Substances at Cluj-Napoca.

The research programs that are carried out also involve the achievement of new products needed by consumers, and in the last 2 to 3 years special programs were also completed for assimilating imported products. The basic technological research that was oriented in these directions was supported by research work regarding the improvement of mining technologies, the assimilation of technological equipment for mining and preparation, the reduction of production costs and energy and fuel consumption, the improvement of working conditions, and others, directions more broadly discussed within the symposium.

As a result of the common efforts made both by the researchers, specialists and workers in the production units of the Salts and Non-Metallic Substances Central and the units of other centrals and by consumer units, today we are succeeding in supplying, to a good degree, the needs of the economy from our own raw materials resources.

From the point of view of quality and varieties, the main consumer of non-metallic substances is the chemical industry, which currently uses products and different quality types that are obtained from over 30 non-metallic substances.

The main raw materials for the great chemical combines come from the salt mine fields of Tirgu Ocna, Ocnele Mari and Ocna Mures in the form of salt solution and even in the form of crystaline salt (Slanic).

Through projects that were drawn up by the Institute, new fields were put into production at Tirgu Ocna and Ocnele Mari, and new fields are to be opened at Ocna Mures. In order to mine these fields in safety, to increase the level of recovering reserves and to have a controled guidance of the dissolution process, broad research was carried out regarding the sizing of salt columns, the pursuit and elaboration of measures for the general stability of salt structures, the understanding and mastery of dissolution parameters, the operation of multiple mines, the automated control of the quality of brine, and others. For the purpose of replacing weak isolating fluids, we are in the process of developing a new, more efficient technology that is applicable

to the specific conditions of our deposits. In the wake of the research and design work that was carried out, new technologies and methods were introduced into all salt mines for mining small rooms and squared and multileveled pillars, which will ensure an increase in the level of recovering reserves from the 15-19 percent of the old mining methods to 30-40 percent for the new methods.

By way of the research work that was carried out regarding the physical and mechanical properties of the salts, the long-term examination of their in situ behavior and the studies conducted on models and theoretical models, today the sizing of pillars and plots is carried out throughout the mining of the field. Although the technological process and the use of adequate machinery that is appropriate for the specific nature of mining salts are well-understood at the mines, it is necessary to continue to have improvements regarding the increase of productivity, the reduction of consumption rates and, especially, the better outlining of pillars, the more correct placement of them in a vertical place and the improvement of the stability of salt structures.

In order to obtain magnesium oxide, probe technological research was carried out at the deposits in Ovidiu, Delnita, Voslobeni, Magureni, Moneasa, Buru, Bratca and so forth, arriving at the conclusion that by using relatively simple and cheap preparation technologies we can provide the quality conditions that are needed from any of the known and explored deposits. The current necessary amount of dolomite is provided by the mine and modernized installation at Voslobeni and from Ovidiu.

In order to supply the necessary amounts of limestone in the granular-size classes required by the chemical industry, the installations at Pietreni, Poiana Aiudului and Valea Somesului were developed and modernized.

On the basis of the research and technological developments that were carried out and the efforts put forth by the production units, current production is supplying the chemical industry with the necessary amounts of chalk, barite, diatomite, graphite, quartz, mica, betonite, talc for use in insecticides and fungicides, kaolin for use as a semi-active filler in rubber and PVC, quartz sand for the production of sodium silicate, perlite and other products,

Although research has been completed, there is still no production on varieties of 96-97 percent carbon graphite, chemically-treated 99.5 percent carbon graphite, tuff for filtering polyesters and for catalysts, pesticide components, wollastonite, pyrophilites, celestine, spodumen, varieties for producing lithium salts, some types of calcites, talc and cosmetic kaolin.

The production of these items which, generally, is in small amounts, is linked to the assembly of certain new technological production lines that will ensure the qualitative characteristics of these products.

This year technologies will be finalized for the production of a series of products, such as: chalk for PVC granules to be used in electrotechnical

products, silicon chalk for grinding processes, graphite varieties for special products and catalysts, Sedistop bentone for laquers and paints, carbon bentonyl for the production of polystyrene, varieties of pharmaceutical talc and kaolin, special kaolin for electric cable casings, clays for anti-acid enamels, different types of calcites, brucites and others.

In order to produce some of these products, there are provisions in the units' investment and development programs.

Another basic consumer branch using non-metallic substances and useful rock is the metallurgical industry, using products and substances obtained from over 20 substances.

The high-percentage products are limestone, supplied for the most part from the mine pits in Dobrodja that are worked on the basis of the technologies of rock-removal, granulation, sorting and documenting. At Mahmudia, there has been a modernization of the granulation-sorting and port-loading installations, as well as an assimilation and modernization of the equipment used in the technological processes on the basis of research work and projects that have been carried out.

Work is currently underway to put to use the new deposit at Baneasa, based on the technology and investment project documentation drawn up by the researchers and designers at the Institute.

The non-metallic products which, in the final analysis, also determine the quality of the steel and iron are the refractory products: refractory clays, the magnesium products and the lining materials.

Our refractory clay deposits are located at Suncuius, Anina, Viezuroiu (Gorj), Botesti and Cristian. The deposits are Suncuius have the greatest potential for reserves. From a quality point of view, the deposits at Anina have the highest percentage of superior varieties, at IP 173-175, but have the lowest potential. For the refractory clay at Suncuius, efforts are concentrated on the reduction of the Fe_2O_3 content. The acidic lining materials are obtained from the facility that just recently started operations at Orsova, while the quality materials are produced by the Institute in the form of semi-industrial production.

For the magnesium refractory materials, broad research has been carried out in the laboratory and in pilot projects on brucite limestone, with favorable results on varieties that are both rich in brucite and poor in brucite content.

Similarly, we are producing the necessary products and varieties for the metallurigical industry in smaller quantities for such items as: quartzite for ferro-alloys and metallic silicons, dolomite, mica, graphite concentrates, various types of quartz, quartz-bearing materials, serpentine, feldspar, potassium clay, sodium-bearing feldspar and others.

Research work has been completed for various types of powdered graphite and tuff, new products which are to enter into production in the near future. Research is in the advanced stage for varieties of clay of the S-30, S-31 and S-32 types that are needed in the production of abrasive materials and which are based on clays from Medgidia. Also for these abrasive materials, we will use certain types of feldspar clay from Ripa lui Filip.

The machine building industry is another large user of non-metallic products, using products and types of products from over 25 non-metallic substances.

The main products are the types of metallurgical sands that are obtained from the deposits and the washing-classing installations at Aghires, Faget-Bega, Valenii de Munte and Balintesti, units that have been developed or opened on the basis of research and projects carried out in recent years. We must note the efforts made to establish technologies for the regeneration of sands, with the first experimental installation for regeneration going into operation at the 23 August Plant in Bucharest, and with another slated to be started at the Progresul Enterprise in Braila.

Bentonite binders for foundries are supplied by the installations at Valea Chioarului, Gurasada and Sintimbru, produced on the basis of recently completed research work and projects.

Sustained efforts have been made to supply various types of graphites to the machine building industry. By opening the deposits at Ungurelasu and modernizing the Baia de Fier installation, currently we are producing a series of varieties, such as type I and II float graphite, refractory pastes, 80-85 percent carbon graphite and a special micronized 90 percent carbon graphite. For precision casting, we are producing special types of calcium kaolin from Aghires and kaolin clays from Medgidia.

For the linings of casting furnaces, we are providing special types of quartzite from Dealul Cerna, acidic lining materials from Orsova and special NAI I and NAI II lining materials to be used by the plants in Cluj-Napoca, Tractorul in Brasov, Progresul in Braila and others.

Research is completed for new types of 95 percent ground carbon graphite, fine float 96 percent carbon graphite, chemical-processed graphite and powdered graphite, with a portion of these being produced in existing facilities that will be appropriately modified.

The technology is completed for the production of bentone-34 and the work for the construction of the installation is underway. For the precision casting of small pieces, research has been completed for obtaining amorphous silica.

Research is in the advanced stage on graphite suspensions and malachite, and in 1984 work will be concluded for obtaining granulated calcium kaolin.

Similarly, the program for research work also calls for the production of white plastic clays needed in the preparation of refractory paints, vitrified silica and bentone-27 for precision casting, colloidal graphite for the drawing of micronic metallic fibers, asbestos powders for mastics, talc for soluable castings, filtering materials for filtering oils during cold-rolling, diatomites for special uses and for filtering mineral oils, mixes of special lining materials and others.

Light industry uses diverse non-metallic products stemming from approximately 15 substances.

The principal products involve varieties of kaolin for porcelain, household pottery, bathroom fixtures, and gritstone, partially obtained from Aghires and Parva. Efforts are being made to remove the iron content by using a powerful magnetic field for separation, as well as to open a new region in the deposits at Popesti and Surduc-Mera where geological research has shown the presence of kaolin-bearing sands of better quality and characteristics close to types A and B.

Feldspar products are produced at the required quality level at the new installation at Capus.

Sands and dolomite for the glass industry are supplied by the installations at Valenii de Munte, Faget-Bega, Miorcani-Dorohoi, Surduc, Voslobeni and Racos, with all the production being obtained on the basis of the documentation completed by the Institute. In the same way, the installation at Uricani for the treatment and enrichment of quartz for glass was also built.

Research has been completed for obtaining potassium feldspar at Ripa lui Filip, high-purity quartz from Poiana Nemanu in the Banat and clays for enameling, with micro-production being slated to start in the Institute in 1984.

The wood industry and the construction materials industry are consumers of 20 non-metallic products from the mining sector.

The main product is the chemically-treated kaolin from Harghita and Parva in a mix with bentonite from Razoare. needed as a filler and chalking material in the paper industry. The quality of these products satisfies the needs of the users. Despite this, attempts are being made to carry out a more advanced distillation of the kaolin from Harghita.

The products and varieties of bentonite, Medgidia clays, feldspar, mica and others are the result of the current production of the units. As a result of the research that has been carried out, we have succeeded in assimilating a furniture polishing paste based on Mirsid tuff which will soon enter into production. The special types of graphite and clay from Botesti are satisfactory for the production of pencil cores.

The electrotechnical and electronics industry is one of the most demanding consumers from the point of view of qualitative aspects and, especially, the purity of products, which generally involve low and high-tension ceramic insulators, as well as electro-insulating materials based on feldspar, kaolin, talc and various types of quartz and mica.

For the production of contact brushes, we have assimilated new types of graphite and for polishing cinescopic tubes we can provide types based on tuff.

Work for the assimilation of graphite dispersants needed to graphite-coat cinescopic tubes and of colloidal graphite for the production of potentiometers, as well as other types of graphite are in the final phase.

In order to polish TV screens, furniture and marble, as well as to process electrotechnical subassemblies, new products are in the process of being assimilated on the basis of using pumice stone.

In the food industry, agriculture and zootechny, the main need for non-metallic products is for limestone for the sugar factories, salt, calcium additives and dolomite for acidic soils.

On the basis of our research, we will use types of volcanic tuff from Vilcea and Mirsid to makes filtering products for wine, oils, beer and sugar.

For zootechny, the research is in the advanced stage for the purpose of using tuff as an additive in food for fowl, cud-chewing animals, pigs and fish.

A succinct listing of the non-metallic products used or scheduled for the future in the main industrial fields, we can see the great diversity of products and the need for them to have properties that are specific to each area of use. From these reasons, non-metallic substances - differing from the other mineral raw materials - require varied and exacting testing in order to:

-- obtain the final product for the consumer (ceramics, glass, plastic, rubber, lacquers, paints and so forth);

-- establish behaviors in cases where they are used as auxillaries (the filtration of food products, medicines and so forth);

-- maintain consistency over time in the quality of the final product (filler materials for paper, PVC, lacquers and paints, catalysts and so forth);

-- ensure the reliability of the final product (refractory materials, rubber and so forth); and

-- adhere to standards concerning the health of people and animals, as well as protection of vegetation.

All these aspects call for the carrying out of research on a broad front and the permanent understanding of the deposits, their qualities, the needs of the consumer branches and the consumers' processing technologies, as well as the handling - in the laboratory and pilot phases - of certain relatively large number of tests which will ensure carrying out preliminary tests for all potential consumers.

After carrying out these tests, it is necessary for the mining product (the concentrate) to continue to be delivered in a regular manner in order to complete and finalize the technology with the consumers.

We must keep in mind all these particular points which are specific to non-metallic mineral substances in technological research activities, as well as in the programs concerning the development of production of non-metallic substances and useful rock.

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